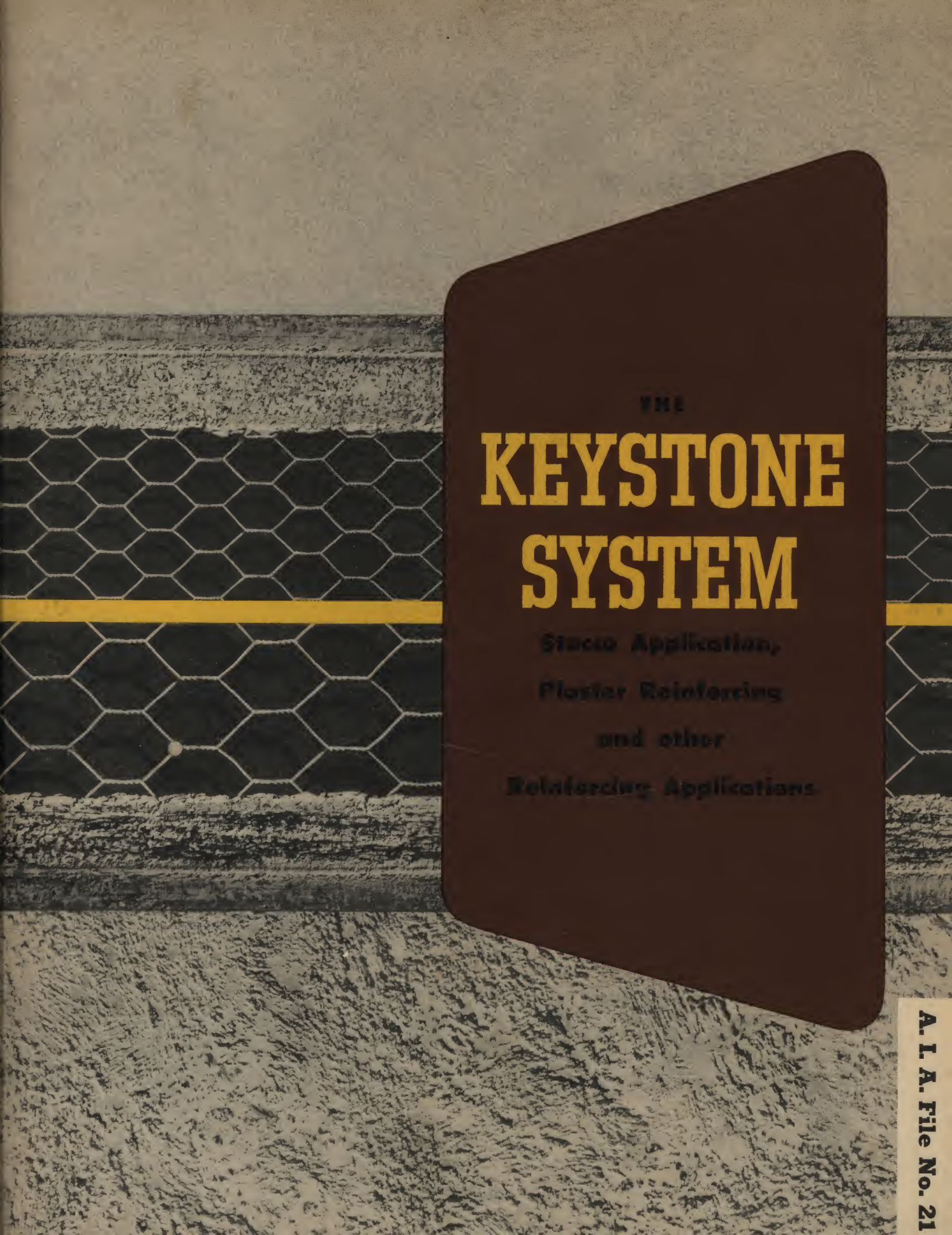


THE

KEYSTONE SYSTEM

Stucco Application,
Plaster Reinforcing
and other
Reinforcing Applications

A. I. A. File No. 21

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PURPOSE OF THIS MANUAL

THIS IS a complete procedure guide for contractors and tradesmen in the application of siding and surfacing materials where open mesh steel reinforcing is required.

In the preparation of this manual, leading contractors and on-the-job tradesmen were contacted to determine most practical and best-recommended procedures. Building trade associations and other authoritative sources supplied additional data. Research and tests by the Keystone Steel & Wire Company also served as valuable sources of information.

As a result of these thorough investigations, procedures have been formulated into Keystone System of Application, as explained on the following pages.

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Prepared by

KEYSTONE STEEL & WIRE COMPANY

Peoria 7, Illinois

Price $1.00 per copy

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MODERN REINFORCED CONCRETE STUCCO

Modern, reinforced concrete stucco offers many advantages to builders and building owners alike. As siding material for homes and commercial buildings, stucco possesses such qualities as strength, durability, ease of maintenance, lasting attractiveness, insulation value, fire resistance and low cost.

Compared to wood siding construction, for example, stucco excels in strength and durability because of the natural strength of reinforced concrete.

Because stucco is a flexible design material, only a little creative thought makes homes built with stucco more appealing than the average wood siding house. Stucco's ease of maintenance is demonstrated by the fact that a simple wash job once a year takes only a few hours, makes buildings look like new—and costs only a few dollars. To illustrate this advantage, it requires several

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Stucco's popularity in many sections of the country is definitely established.



The durability, strength and low cost of stucco makes it well suited for northern climates.

days and costs several hundred dollars to paint a wooden structure. Stucco's fire-resistance makes it superior over wood. From a cost standpoint, stucco can be applied for approximately 15% less than 2-coat painted wood-siding construction. Tests have also shown that stucco saves money by reducing heat loss as much as 13%, compared to frame construction.

When compared to brick and masonry construction, stucco is equivalent or superior in strength, durability, lasting attractiveness, fire resistance, ease of maintenance and insulation qualities. A cost comparison shows that stucco can be applied for approximately 1/3 the cost of brick construction and approximately 1/5 the cost of lannon stone.

This means two vital cost advantages to contractors:

1) You can profitably build quality houses *at lower cost.*
2) You can add additional selling features to houses that make them more sales-appealing at *no increase in cost.*

A wave of stucco popularity started in the home building field about the turn of the 20th century, and many homes erected at that time testify to stucco's performance and durability.

Unfortunately, there were examples of "synthetic" stucco applications during the 1920's that resulted in misconceptions regarding the durability of stucco. Much of this imperfect work was due primarily to the use of unstable materials and also to the lack of good



Stucco means economy, attractiveness and ease of maintenance for commercial buildings.



Attractive exterior with simulated stone, simulated wood siding and stucco block pattern.

methods of reinforcing stucco.

Today, with the use of quality material and good methods such as the Keystone System of Stucco Application, stucco is a practical, durable building material that will withstand freezing and thawing, heat or cold, and wet or dry climates. Stucco homes are popular in Green Bay, Wisconsin, Minneapolis, Minnesota, Sioux Falls, South Dakota, as well as Canada, as testimony to this fact. Changing climatic conditions have had no bearing on stucco's durability in these northern areas.

Country-wide surveys show that more than 1/3 of today's home-buyers are receptive to stucco construction. Another 1/3 are willing to consider stucco—indicating wide general acceptance and evidence of stucco's saleability.



Stucco serves ideally for economy housing (above) because of its lower cost. It also appeals to buyers of luxury homes (below).



SECTION ONE
The Keystone System of Stucco Application

The Keystone System of Stucco Application was developed as a guide for builders, lathers and plasterers, to insure a durable, attractive, economical finished job. This system is not a radical development, but rather is a combination of best-known methods used by builders and tradesmen. It also incorporates recommended procedures developed by associations and technical experts in the building industry.

For purposes of simplification, the Keystone System comprises five basic steps in stucco application:

1) Start with good building design and construction
2) Reinforce stucco with Keymesh for durability
3) Apply three well mixed, properly cured stucco coats
4) Bring out stucco's full beauty
5) Take pride in your craftsmanship

These are the basic steps to be followed in applying stucco on new homes. Detailed procedures are given on the following pages.

An apartment house project—one of the buildings being readied for the application of stucco.



The finished apartment house project—attractive, durable, economically built structures.

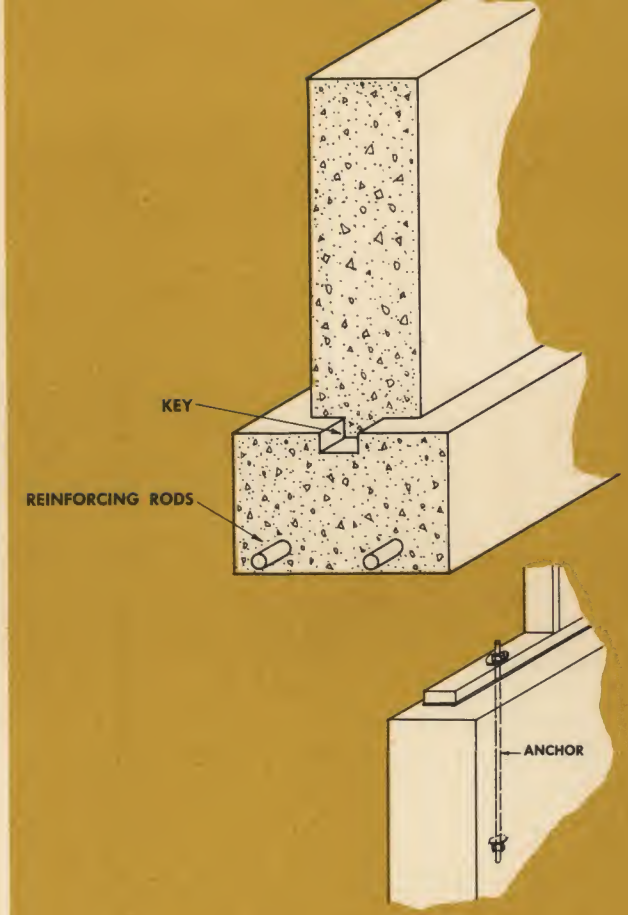


Step I
Start with Good Building Design and Construction

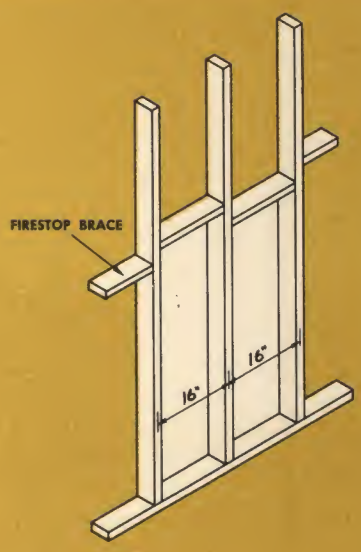


Normal methods of sound construction—such as is required for houses to be finished with wood siding or masonry—are required for stucco. A solid foundation and rigid framing that will hold eventual "settling" and structural movement to a minimum will also help to insure stucco's crack-resistance and durability. In addition, durability and water-tightness of concrete stucco is determined by the proper conditioning of the building to be stuccoed. The object is to prevent any possible openings where moisture can seep behind the stucco and eventually cause deterioration.

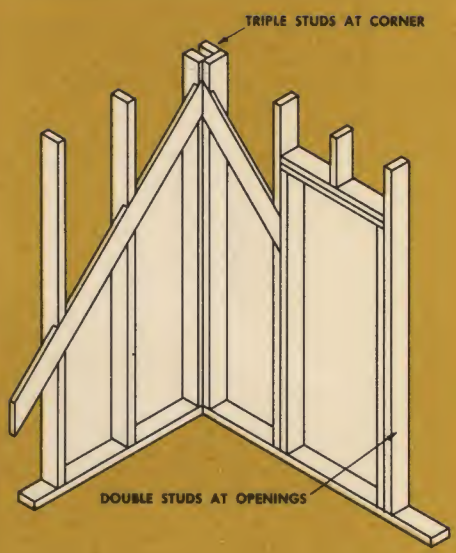
The illustrations which follow serve as a check list of construction requirements:



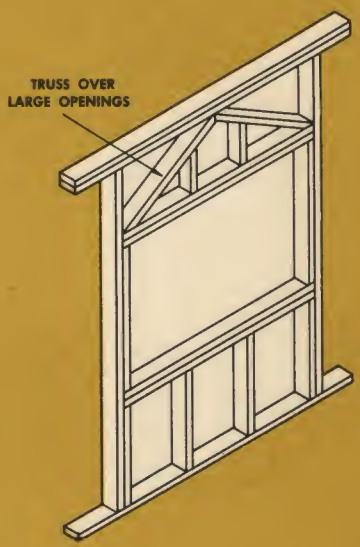
1. Solid footings are essential to rigid construction. Avoid narrow footings, especially on filled-in land.



2. Spacing of studs should not exceed 16 inches on center. Fire-stop bracing is desirable. Use well seasoned lumber for structural members.



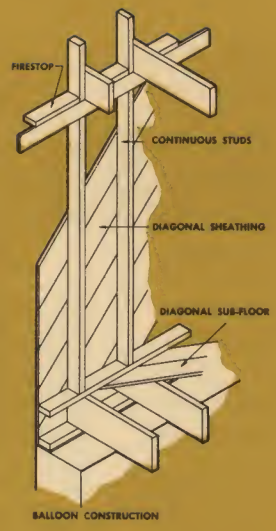
3. Double studs at corners and around openings are essential.

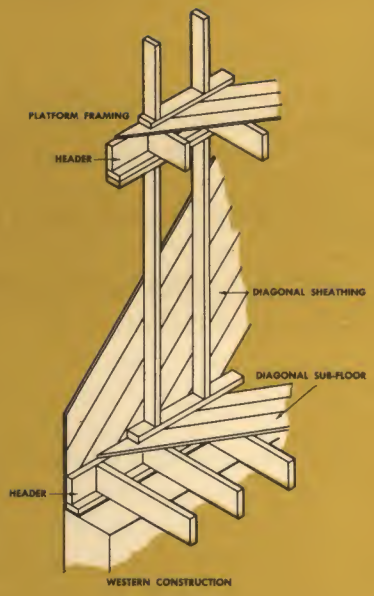


4. Trussing over openings of more than four feet in width adds rigidity to the structure.

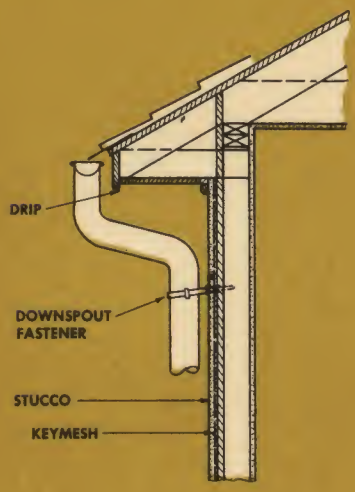


5. Diagonal bracing at corners, with bracing let into the studs, is a standard requirement for good construction.

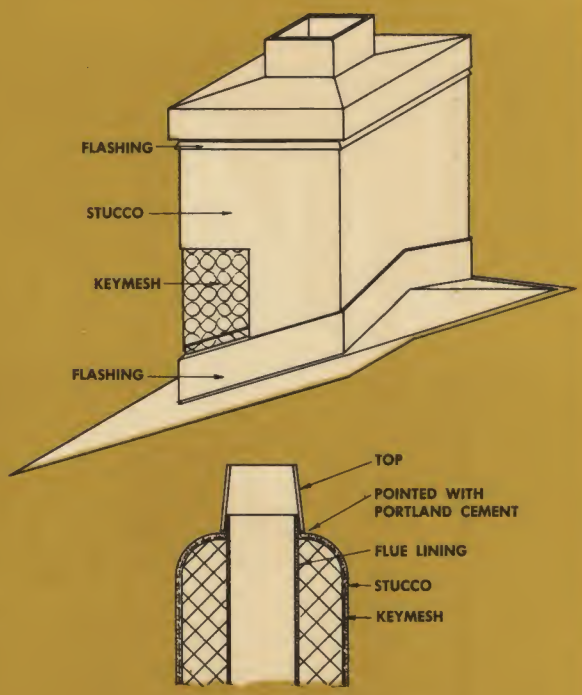




6. Regardless of the type of construction, good building practices should be followed. With balloon construction, studs should be tied together below second floor joists, with 1 by 4-inch boards let into the inner faces of the studs; studs should be continuous and securely spiked to joists. In Western or Platform construction, all members should be properly positioned and securely nailed together to prevent abnormal movement of the structure after completion.



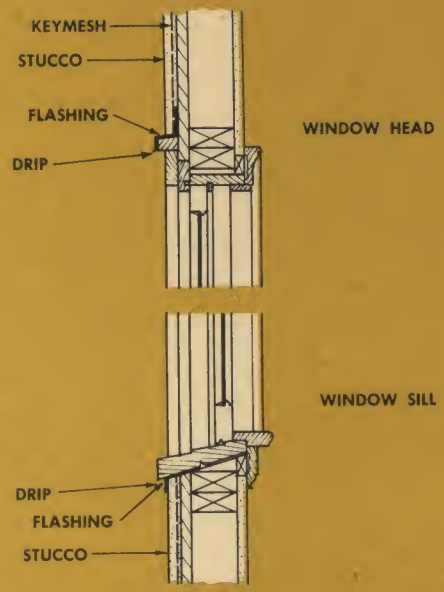
7. Concentration of water flow should be prevented wherever possible by the use of overhanging roofs or similar projections. All projecting members should have a slope on the upper surface and a drip on the lower surface to shed water quickly.

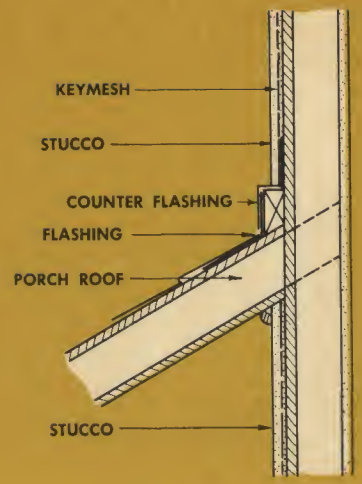


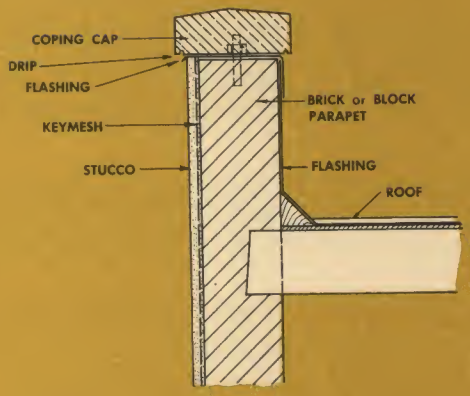
8. If chimneys are to be stuccoed, give them special attention—protect them with flashing and reinforcement.

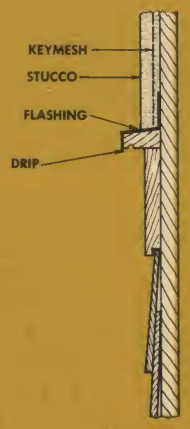


9. All hangers, fasteners, trim or other fixed supports or projections should be in place prior to the application of stucco.

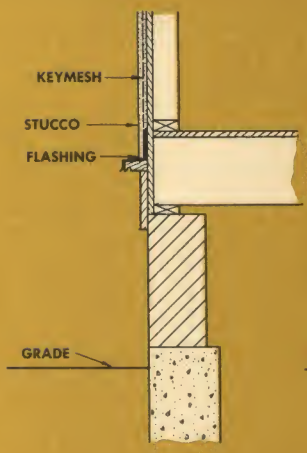


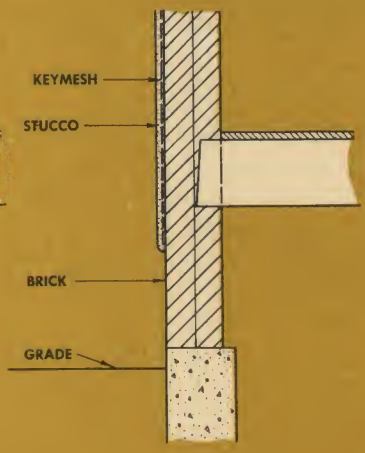


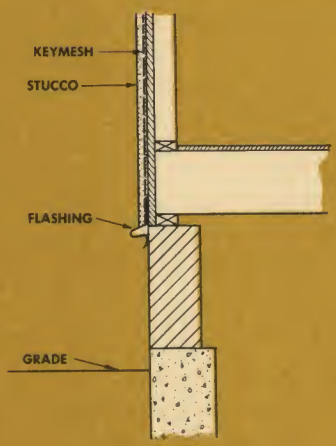


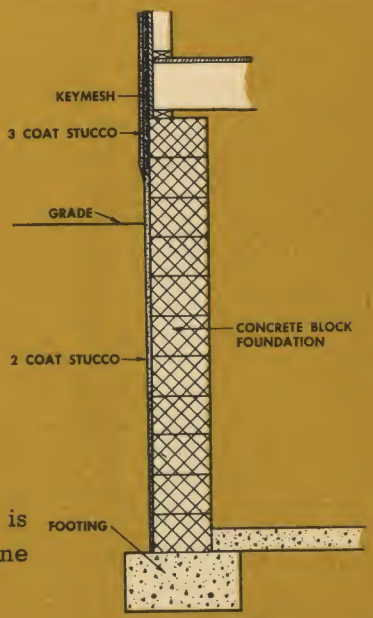


10. Flashings of an approved rust and corrosion-resisting material should be properly positioned before stuccoing is started. Place flashings at the tops and along the sides of all openings where projecting trim occurs; under copings and brick sills; under built-in gutters; around all roof openings and at other points of possible moisture access. Plan on applying reinforcement where stucco is to be carried over flashing.









11. It is advisable to stop stucco at least six inches above the grade line. This prevents possible moisture seepage below the ground and avoids discoloration of the stucco due to mud-splashing. In some areas stucco is run below the grade line as shown in one of the illustrations above.



Various types of sheathing may be used—wood fiberboard or gypsum board.



Waterproof building paper or felt weighing not less than 15 lbs. per 100 sq. ft. being applied.

Step II
Reinforce with Keymesh for Durability



When the structure to be stuccoed meets the basic requirements of good design and rigid construction, and when flashings and trim are correctly in place, you are definitely on the way toward a top-quality stucco job.

When you reinforce stucco with Keymesh Reinforcing you have taken an additional step to insure strong, durable construction. The use of Keymesh means that strong, galvanized, rust-resistant steel mesh is deeply embedded in the stucco—embedded in the center of the stucco to prevent breaks in the wall caused by structural movement.

First, Keymesh Reinforcing is furred out 1/4 inch to 3/8 inch away from the building felt base. The open mesh design of Keymesh later permits the plaster to flow through—and around—the reinforcing, thus deeply embedding each steel wire. Consequently, the finished stucco wall has a backbone of strong steel wires to give it added strength. This backbone of steel wires also helps make stucco crack-resistant.

Keymesh permits easier, faster, smoother lathing because it unrolls flat, goes into place flat and lays flat. It forms around corners easily. It has no rough surfaces to cut lathers' hands.

The end result is always a true, strong and durable wall of reinforced concrete stucco—construction that any builder can be proud to present to home buyers.

On Sheathed Construction

Actual application of Keymesh reinforcing varies with the structural base—that is, sheathed or open frame construction. Specific methods are explained below.

Where the structure is of sheathed construction, sheathing should be more than 8 inches wide, and nailed securely to each stud. Diagonal sheathing is preferred for its increased rigidity. Then the sheathing is covered with an approved waterproof building paper or felt weighing not less than 15 lbs. per 100 sq. ft., applied in weatherboard fashion with each strip lapping the strip below by at least 3 inches. It should also overlap adjacent flashing by at least 3 inches.



Eighteen-gauge wire being stretched tightly across studs for open frame application.



Eighteen-gauge wires in place. View also shows flashing strip.

On Open Frame, or Direct-to-Stud

On open frame construction, stretch 18-gauge wire tightly across the faces of the studs at 6 to 8-inch intervals. This can be accomplished quickly by first partially setting nails in studs at ends of walls and openings. Then stretch the wire back and forth around the nails starting at the top of the area and continuing to the bottom.

It is extremely important that these band wires be tight, but not to the point that tightening will pull door and window frames out of position. After wire has been applied, additional tension can be obtained by forcing a wire up or down the nailing to the stud. After wires are in place, 15-lb. or heavier waterproof building paper or felt is applied by nailing to studs, thus giving a firm backing for stucco.

Wires are tightened by forcing them up or down and nailing them firmly to the studs.



After wires are in place waterproof building paper is applied directly to the building studs.



Application of Reinforcing

Keymesh Reinforcing is recommended for stucco work because it is specially designed to increase the strength and durability of stucco. Keymesh is made of tough, heavy gauge cold drawn steel wires, tightly woven in a reverse twist, into an open mesh design. The uniform hexagon openings in Keymesh are desirable because the mortar flows through to the backing, completely embedding the metal. It is galvanized to insure lasting strength and rust-resistance. The clean, bright, corrosion-free surface of the mesh "keys" tightly to the concrete, insuring permanence.

Keymesh Reinforcing handles easily because the reverse twist weave makes it unroll flat and go into position flat. Lathers do not have to fight it into place.

The procedures for applying Keymesh Reinforcing are simple. The first step is to unroll the mesh and cut the roll into approximately three equal sections, for easy handling. Then apply it horizontally around the building. The use of Keymesh furring nails automatically furs out the mesh to correct distance from the paper backing. Details of procedure are explained and illustrated in the accompanying photographs.

These are the Procedures for Applying Keymesh Reinforcing



1. When unrolling Keymesh Reinforcing, keep the Keymesh roll on the outside—away from the building—for smoother, faster application. Hang Keymesh horizontally by nailing across the top of the complete stretch—just enough to hold it in position. Then nail at 12- to 16-inch intervals all across the top.



2. Nail the mesh securely at each end of the stretch. When applying over sheathing, start at least 6 inches from a corner of the building and run the mesh around the corner. On open frame construction, start reinforcing one stud away from the corner.



3. Use Keymesh furring nails to apply Keymesh so that it will be furred out 1/4 to 3/8 inch from the building felt. For wood sheathed construction, use 1 1/4-inch furring nails and space them 12 to 16 inches apart horizontally and 6 to 8 inches apart vertically. For fiber sheathed construction use furring nails long enough to penetrate 1 inch into the stud, and space them at 6-inch intervals along each stud.

4. After Keymesh has been hung and nailed at ends, nail the mesh into place, working from top of stretch to bottom. At ends and sides of mesh, lap one full mesh and nail them together securely. Laps at ends should be staggered. On open frame construction, lap the mesh along studs. Reinforcing should also be carried over flashing, overlapping 3 inches, to provide adequate coverage to prevent moisture seepage.



5. When applying Keymesh, start furring nails on a downward slant, then stretch the mesh vertically tight by straightening the nails when driving them home. In gable ends, place one strip of Keymesh at top along roof line, as illustrated at left. This saves cutting of horizontal strips to exact shapes.



6. In most cases, particularly over upper-story openings, extend Keymesh over windows and openings. The lather can quickly cut out sections for such openings, saving the pieces of mesh for filling in odd spaces under the eaves, etc. This is much faster than cutting and fitting the mesh up to such openings. Over large windows, only the top and bottom rolls may be extended across openings. Full rolls in the center of the area may be stopped at the opening.

Step III
Apply Three Coats of Well-Mixed Stucco, Cure Properly



In this step the first procedure is to obtain correct mixtures of mortar.

Each coat of stucco should be not richer than 1 part by volume of portland cement to not less than 3 nor more than 5 parts by volume of damp, loose aggregate. Where aggregate is well graded with a good proportion of coarse particles, a 1 to 3½, or 1 to 4 mix may be found satisfactory. Do not use fine sand or large amounts of admixtures. Too much cement will also cause crazing or checking.

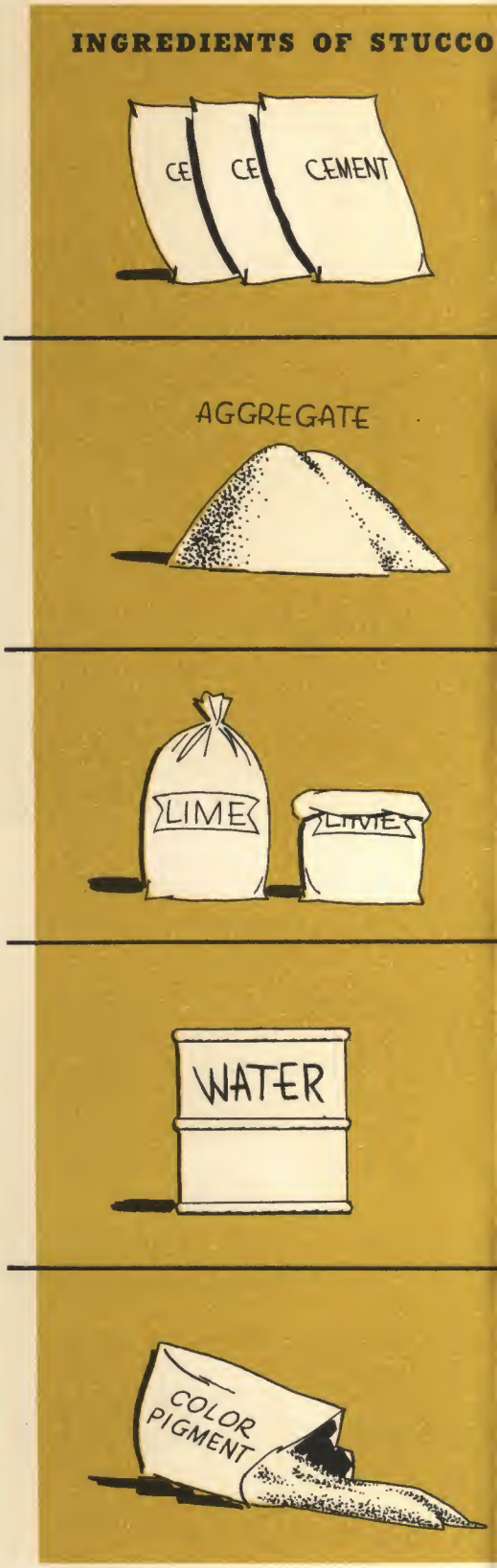
Proportioning will sometimes depend upon the type of aggregate, so no hard and fast rules can be made here. Customary practices which have proved to be good are always worth continuing.

Aggregate should consist of clean sand or screenings from crushed stone or slag. It should be uniformly graded with not less than 15% retained on a No. 14 screen and not more than 5% passing a No. 100 screen. Not more than 35% of aggregate material should be of any one Tyler standard screen size. Use aggregate of uniform moisture content. Aggregate should be free from harmful amounts of loam, silt, soluble salts and vegetable matter. Practically speaking, sand or aggregate always should be as coarse as possible, to maintain proper plasticity.

For finish coats, it may be necessary to use a somewhat finer aggregate, but keep in mind that excessive fineness is one of the principle causes of crazing and cracking.

Water used in the mix should be clean, free from oil, acid, alkali or vegetable matter. A common rule is that water used should be fit to drink.

Hydrated lime may be added as a plasticizing agent in an amount not to exceed 10% by weight or 25% by volume of the amount of portland cement. Ready-made lime putty is



MIXING OF STUCCO



available for this purpose, and is preferred over lime putty mixed on the job. If necessary to mix lime, however, soak hydrated lime not less than 16 nor more than 24 hours prior to use and add to the mix in the form of lime putty. The addition of lime makes the mix easier to work, but be careful not to add too much, since excess lime in the mix will cause checking.

There are other admixtures which may be used as plasticizing and waterproofing agents. The amounts added will vary with the kind of agent used, the grading of the aggregate, proportion of cementing materials to aggregate, and other factors. Use only the smallest amount needed to secure the desired plasticity. Hair or fiber is used in some areas, but experts generally agree that its use is unnecessary. If directions for use of admixtures are not clear, use only standard mixtures.

Measure materials accurately and proportion all batches exactly alike. Mix materials to a uniform color before water is added. Then wet-mix them to the consistency that is easily worked and applied. Correct amount of water in the mix generally is determined by trial and test method. Use only enough water to permit easy handling of the mud. Excess water can result in an unstable stucco job. *The less water in the mix, the better the quality of the mortar, within working limits.*

Thorough mixing is essential. Run a mechanical mixer three to five minutes after all ingredients are in the drum. In handmixing, hoe the batch back and forth ten to fifteen minutes after the water is added. Let stucco stand at least one hour before using it. A mortar that has set should not be retempered for re-use. However, mortar made with normal portland cement is not injured by standing 2½ to 3 hours if it is re-mixed frequently *without adding water.*

After flashings, trim and Keymesh Reinforcing are securely in place, and the mixtures worked to the desired consistency, you are ready for application of the stucco.

The use of Keymesh Reinforcing, furred out to the correct distance from the backing, not only adds strength to the stucco but also helps plasterers to apply a smooth, even scratch coat. This in turn results in uniform brown and finished coats.

Stucco can be applied in cold weather, but should be adequately protected against freezing for at least two days after application. Temperatures above 40 degrees Fahrenheit should be maintained during the two-day curing period. Covering the stucco with tarpaulin will do the job in mildly cold temperatures.



Applying Stucco

Recommended practice requires that stucco be stopped four to six inches above the finished grade line to avoid moisture seepage from the ground. Various ways of filling in the grade-line area are shown in illustrations on page 7. Running the stucco below the grade line is used in some areas with reasonable satisfaction, but is undesirable because of splashing of mud and dirt on the finished surface.

Do not apply stucco on flat horizontal surfaces directly exposed to weather, such as watertables, sills, etc. Concentrated water flow on stucco may not affect stucco's durability but may cause staining.

Proper curing of stucco is important. After a damp-curing treatment, each stucco coat should be allowed to dry thoroughly before the next coat is applied. Curing methods may vary, of course, in different parts of the country, due to climatic conditions.

The practice of doubling coats without a two-day moist-curing period followed by a drying interval is not good construction practice.

These directions apply to all stucco applications where reinforcement is embedded in the scratch coat—for new stucco on frame construction, or for overcoating on masonry, wood siding or old stucco.

When Keymesh Reinforcing is used the scratch coat flows through and around the mesh, embedding it securely.

The brown coat is also applied to a thickness of 3/8 inch. The thickness of the finish coat should be 1/8 to 1/4 inch, so that the total thickness of the three-coat job is one inch. This provides a strong, durable wall that provides more advantages than masonry, at considerably lower cost.

Scratch Coat

Apply the scratch coat 3/8 inch thick. Because Keymesh Reinforcing is strong and rigid and of open mesh pattern, the mortar flows readily through the openings and completely embeds the reinforcing steel strands for lasting strength and crack-resistance.

Apply the scratch coat, and all succeeding coats, continuously in one direction, without allowing the stucco to dry at the edges. Stop only at natural division points, such as corners, doors or windows.

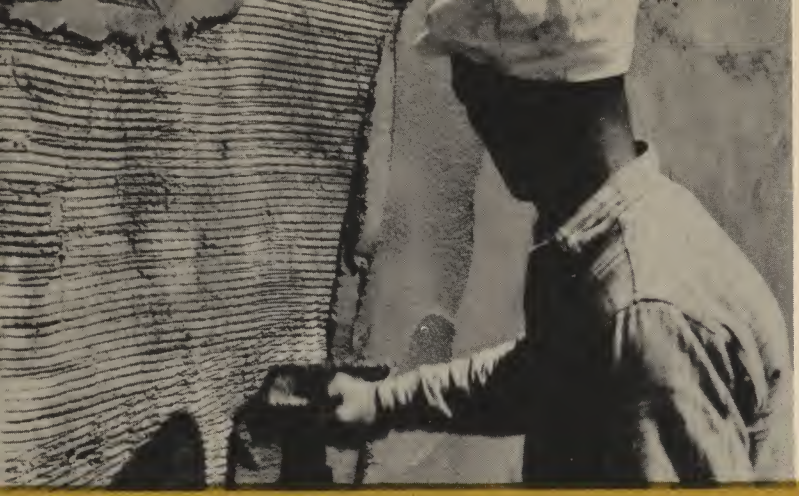
Before the scratch coat hardens, it should be evenly scored or "scratched" horizontally to provide good mechanical key for the second or brown coat.

Thorough curing of each coat of stucco is essential for good construction. The scratch coat should be allowed to dry out for about 48 hours, then should be dampened with a fine fog spray before the second coat is applied. Variations in temperature and humidity will have a bearing on the moistening and curing process, and therefore local practices may sometimes determine the exact procedure to be followed.



The first coat, applied 3/8 in. thick, is then scratched in preparation for applying the second coat.





After dampening the thoroughly cured scratch coat the second or brown coat is applied.



The brown coat is cross-scratched lightly to provide a bond for the third or finished coat.

Brown Coat

The brown coat is ready for application after the scratch coat has been properly cured. It is an important coat inasmuch as it adds the necessary thickness to produce a finished, 3-coat stucco job possessing the proper strength and durability.

Before starting to apply the brown coat, dampen (but do not soak) the surface evenly with fine fog spray. Work on the shady side of the building when possible. Make the brown coat about 3/8 inch thick. Bring the brown coat to a true, even surface by "floating" or "rodding." It should be cross-scratched lightly to provide a bond for finish coat.

Moist-cure the brown coat for at least 48 hours. Then allow it to dry for approximately seven days before the final coat is applied.

Finish Coat

Again, dampen the preceding coat evenly with a fine fog spray before starting the finished coat. The thickness of this coat should be sufficient to obtain a good surface texture, but in no case less than 1/8 inch.

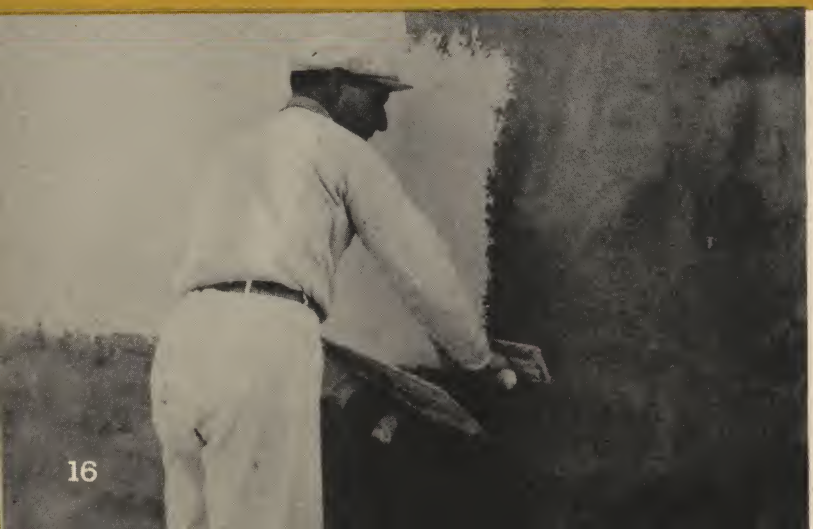
When applying the finish coat, work should be planned so that an entire wall can be completed at one time to eliminate joining marks. If that is impossible, a corner, door or a window can be used as a breaking point.

When waterproof cement is used in base coats, moisture absorption is retarded and dampening before applying succeeding coats is not advisable except in hot, dry weather.

If the finish coat is factory-made material, follow manufacturer's directions closely.

For texturing and coloring finish coats, see Keystone System Step IV on the following pages.

After moist-curing the brown coat for at least 48 hours the finished coat is applied.



A wide variety of attractive finished treatments can be obtained with stucco.



Step IV
Bring Out
Stucco's
Full Beauty



Stucco is an attractive siding material that can be beautified even more by texturing and coloring. Many textures are commonly used to vary the finish of stucco houses. Likewise, a variety of colors can be obtained.

Texturing and coloring has been highly developed in some parts of the country, and accordingly stucco homes in these areas possess added sales appeal.

Texturing Stucco

Portland cement stucco, because it is plastic and flexible when applied, can be finished in a wide range of textures. The limits are determined only by the knowledge and skill of the plasterer.

Basically, there are four types of finishes: stippled, sand-floated, sand sprayed and rough cast or spatter-dash.

For a stippled finish, trowel the finishing coat smooth with as little rubbing as possible. Then lightly pat the surface with a broom straw brush.

A sand floated finish is obtained by rubbing the surface in a circular motion with a wood float. A little sand is added to slightly rough the surface. This floating should be done when the mortar has partly hardened.

Sand spraying is done with a wide, long-fiber brush—(a whiskbroom serves the purpose)—after the finish coat is brought to an even surface. Dip the brush into a creamy mixture of one part cement to two or three parts sand, mixed fresh at least every thirty minutes and kept well stirred. Throw the coating forcibly against the surface to be finished, while the stucco is still moist (within 3 to 5 hours after the finish coat has been applied).

Rough cast or spatter dash treatment is done after the finish coat has been brought to a smooth, even surface with a wooden float. A mixture of one sack of cement to 2 or 3 cubic feet of fine aggregate, wet to the consistency of cream, is thrown forcibly against the finish coat. A long fiber brush serves the purpose. Avoid rapid drying out of this finish by wetting down at intervals after stucco has hardened.

Stucco is well suited as an exterior finish for practically all architectural styles. Its attractiveness is frequently accentuated when stucco is combined with other building materials.









Stucco textures can readily be varied to suit the type of architecture or to change the appearance of houses in a building development. Stucco is a flexible, versatile siding material.

Whatever style of architecture is selected, a texture may be used which will harmonize with it. Stucco is also combined with other siding materials to produce attractive results. The fact that stucco is a flexible and versatile design material makes it possible to build distinctive-appearing stucco homes that possess outstanding sales appeal.

Finishes have been named to fit the architecture with which they have been identified. For example, a smooth colonial finish adds to the charm and simplicity of colonial architecture. Irregular, feathered finishes, such as English Cottage, go with houses of English design. Smoothly irregular surfaces like Spanish and Mexican are appropriate to Spanish architecture. There are also textures to suit modern American, French, Italian and other popular architectural styles.

Attractive finishes can also be obtained by simulating stone construction. This is done by the use of moulds, or by hand work. A skilled plasterer can soon become expert at such simulated stone work, even though he may not have had much experience with it. The "trick" of the work is to obtain a natural stone effect, which is accomplished by brush-splashing of red and yellow color into the stucco, and finishing the surface with natural-appearing "mortar joints." The use of a caulking gun to fill in simulated "mortar joints" (cut into the stucco finish) helps to achieve naturalness. The "mortar joints" are finally roughened by the use of a rough-pointed tool or just a plain stick. Slight irregularity of "mortar joints"—rather than straight, even lines—also makes the surface appear more like natural stone.

Illustrations and explanations for obtaining the various stucco finishes are given on the accompanying pages.

Spanish Texture



1. Apply finish coat in rather heavy layers, using round-point trowel—a full trowel of fairly stiff mortar per stroke.



2. Make strokes in all directions, curving and varying them to form rolling ridges and hollows in the finished surface.



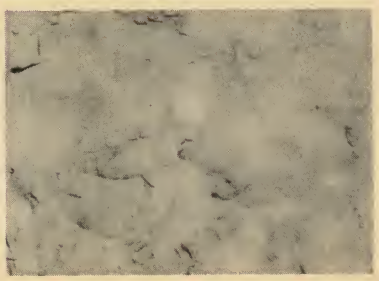
3. A left horizontal stroke. Uniform dampening of brown coat helps spread this finish; makes mortar stand as placed.



4. Irregular overlapping helps, but avoid excessive troweling in producing any portland cement stucco texture.



5. Smoothing out rough edges with round-point trowel before mortar hardens to a point where workability is lost.



6. A wavy, trowel-marked finish, with stucco compacted and surface pores closed—the popular Spanish Texture.

Californian Texture



1. Use full sweep spreading as in creating the Spanish Texture, stroking full trowels of mortar in all directions.



2. Creating this texture requires a rounded trowel, as there are no straight-line markings. Use only curved strokes.



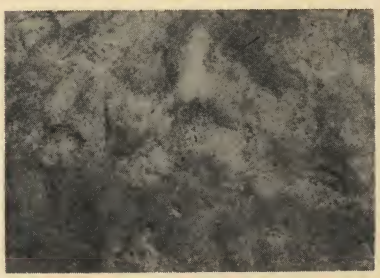
3. Preliminary appearance. Notice that full trowels of mortar are left in place without additional smoothing.



4. Before mortar hardens, rub its surface down with a wadded piece of burlap to produce irregular, coarse surface.



5. To finish texture, trowel entire area, creating highlights. Force sand particles into mortar, compacting the surface.



6. Californian Texture is a rubbed, troweled finish—like plaster over an irregular surface, with highlights.

Italian Texture



1. Applying thin backing coat over entire surface to insure uniform color, even though dash coat may not cover.



2. Dashing mortar a different color (if polychrome effect is desired) with quick strokes of whisk broom.



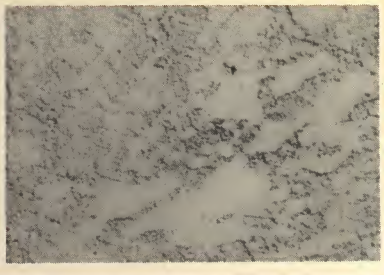
3. Method of holding bucket for spatter-dash work. Bundle of reeds may be used instead of whisk broom.



4. Close-up showing spatter-dash finish. Allow this dash coat of mortar to set partially before final finishing.



5. To finish, place trowel flat against dash coat; draw it evenly across wall, left to right.



6. A troweled, spatter-dash finish. Uniform appearance produced by keeping dashing and troweling time constant.

English Cottage Texture



1. Applying thin backing coat about $1/8$ in. thick. Portions of this are exposed in final texture.



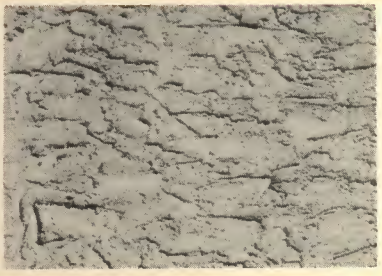
2. Feathering with square trowel, as small amounts of mortar are added with short, twisting strokes.



3. Showing how stucco is pinched off in all directions. Avoid vertical or nearly vertical strokes when feathering.



4. Small trowel of mortar. Variations obtained by amount of mortar, stroke length, and twisting motion.



5. The English Cottage Texture is a fine, leaflike finish. Heavier applications are sometimes desirable.

Colonial Texture



1. Applying browning coat for Colonial Texture, which is one of the most popular portland cement stucco finishes.



2. Floating browning coat with wood float to insure a regular, even surface. Use circular motion.



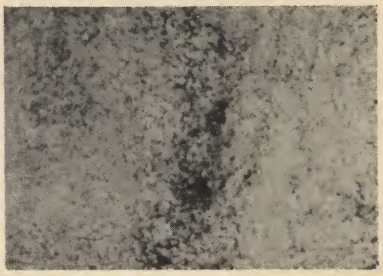
3. Applying finishing mortar in a very thin, hard coat. Allow to stand until hardened sufficiently.



4. Wetting with a brush may be necessary to moisten the wall enough to permit rubbing with a carpet float.



5. Carpet floating the surface. Use a circular rubbing motion, which produces an evenly sanded finish.



6. A smooth, sand-floated surface. Use the lighter tints—white, ivory, buff or occasionally a pale cream yellow.

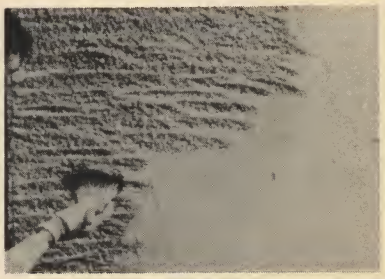
Italian Travertine Texture



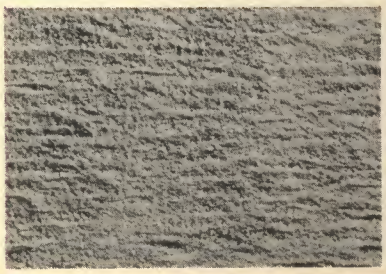
1. Apply a very thick coat of mortar (about 3/8 in. thick) to a well-dampened brown coat that will retard hardening.



2. Trowel finish coat fairly smooth. Then stipple deeply, using whisk broom or wire brush.



3. Hold the brush at an angle, as shown above. Stippling should be irregular in appearance. See photograph in Fig. 4.



4. This photograph shows appearance after stippling. This surface is later troweled while it is still plastic.



5. Troweling horizontally smooths out the higher portions. Depressions made by stippling remain rough.



6. Stippled, troweled finish. Greater pressure on trowel will give finer veining. Cut joints with jointing tool.

Modern American Texture



1. Covering application (about 1/4 in. thick) for this rough-torn texture. Coat is rather heavy to permit roughening.



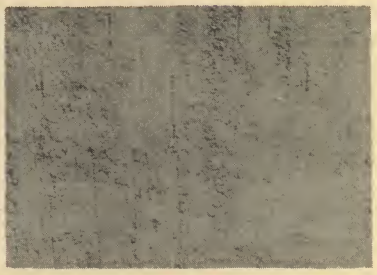
2. Full spread placing is the best method to produce the preliminary finish. Make no special effort to remove trowel marks.



3. How to make a lightly torn surface. Never use a downward stroke. Tilt the block at an angle as it is drawn up.



4. To tear the surface lightly, hold the board in one hand; if heavier texture is desired, use both hands.



5. Modern American Texture is a tapestry finish. Its surface may be lightly brushed with a different color pigment.

Plastering and Texturing Tools



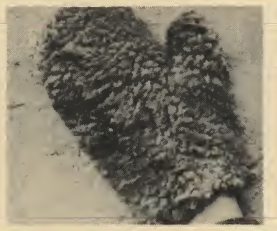
Standard plastering trowel.



Small leaf tool used for fine pointing.



A rubber sponge produces a pleasing surface.



Sheepskin glove used to rub down heavy textures.



A round point trowel.



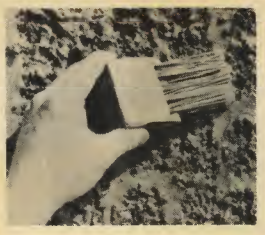
Wood float, covered with carpet.



Rubber glove used in making hand textures.



A cork float.



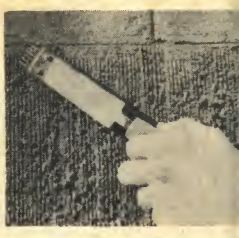
Wire brush used in making "Travertine" texture.



The Dutch brush.



The jointing tool for marking off surfaces.



Combing tool for producing a tooled stone finish.

Coloring Stucco

Best results in the mixing of color pigments on the job can be obtained by experiment and trial. Variations in color of sands, as well as pigments themselves, make a difference in the finished product.

In fact, it is desirable to use factory-made colored portland cement stucco to attain accuracy in measurement and thoroughness of mixing. Factory-mixed colored stucco frequently cannot be approached by colored finish mixed on the job. A colored cement may also be used, and mixed with the aggregate.

If the colored coat is to be mixed on the job, use only high-grade mineral pigments. Mix predetermined weights of pigment—not exceeding 6% to 10% of the weight of the cement—with the aggregate, before the cement is added.

In hand mixing, the pigment, aggregate and cement should first be shoveled from one pile to another through a 1/4 inch mesh wire screen, until the entire batch is of uniform color. Water is then added.

A general guide for the selection of coloring material follows:

For maximum brightness and clearness of color, and for light shades, use white portland cement.

For *white,* use white portland cement.

For brown, use burnt umber or brown oxide of iron. Yellow oxide of iron may be added to obtain modification of this color.

For *buff,* use yellow ochre or yellow oxide of iron. Red oxide of iron may be added in limited quantities.

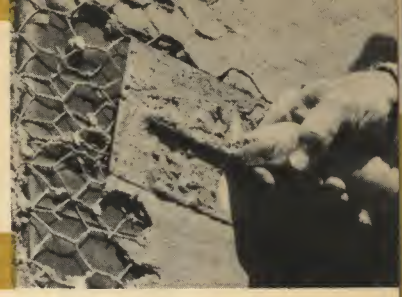
For *gray,* use small quantities of black iron oxide, manganese black or Germantown lampblack.

For *green,* use chromium oxide. Yellow oxide of iron may be added.

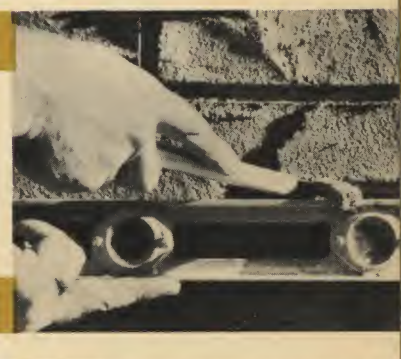
For *pink,* use small quantity of red oxide of iron.

For *rose,* use red oxide of iron.

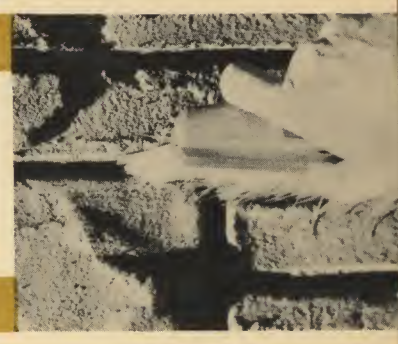
For *cream,* use yellow oxide of iron in small quantities.



Step one in the application of stucco to simulate stone-type finish—troweling a heavy layer of stucco.



Cutting imitation mortar lines, using a straight edge of a level as a guide. Various imitation stone sizes are cut this way.



The cut stucco is thoroughly brushed before drying to create the effect of smooth, rounded stones.



In some cases a waterproofing agent is applied over the entire surface, insuring protection from dampness.



The simulated stones are brush-painted with mineral base colors to imitate any desired type of stone.



Grooved mortar lines are roughened and then painted to imitate the appearance of cement work holding the stones in place.

Refinishing and Maintaining Stucco

There has been considerable emphasis in this manual on the point that, if properly applied, stucco is crack-resistant. This statement is based partially on the distinction between cracking and checking, or crazing. The latter is likely to appear in the finished stucco coat, particularly if there is abnormal settling of the building or if the finished coat contains too much cement or fine sand or is otherwise improperly mixed or applied.



There is a simple solution to any checking or crazing that may show up in stucco finishes. It consists of an application of a stucco refinish mixture of thin Venetian portland cement and whitewash, or other commonly locally-used mixtures. Applying such refinish jobs is a simple, inexpensive job, and can be done quickly and easily.

In fact, it is wise to recommend to the home-owner that he apply such refinishes to stucco every two or three years in order to keep stucco clean and new-looking. The cost amounts to only a few dollars and the application is as simple as whitewashing a fence.

The home-owner can also keep up the attractive appearance of stucco by simple washings with water. A garden hose and brush serves this purpose adequately.

Step V
Take Pride
In Your Work



This step in the Keystone System is added only as a factor in producing a top-quality stucco job. There is no substitute for pride of craftsmanship, which all good builders and tradesmen know. Just the smallest attention to detail can sometimes make the difference between a truly good and an ordinary job.

The Keystone System of Stucco Application helps achieve a finished job you can be proud of, because it insures strong, durable stucco that is easy to trowel to even thickness. When followed through every step, the finished result will be homes that are attractive, easy to maintain and of everlasting pride to the builder as well as to the owners.

Giving stucco a new, fresh appearance is a simple matter of applying a dash coat or merely washing it with the use of a garden hose. This ease of maintenance is another advantage to home owners.



SECTION TWO
The Keystone System of Stucco Overcoating

Modern reinforced concrete stucco is exceptionally well suited for renovating older buildings, including both commercial buildings and homes. As a new siding over old wood or masonry walls, stucco adds charm and beauty to homes, stores and other structures. No other material serves as well to modernize buildings and to give them a fresh, new appearance. Compared to the cost of exterior painting every two or three years, stucco overcoating also represents considerable savings to home owners.

Examples of different overcoating applications are shown on the accompanying pages. They demonstrate how homes can be attractively refinished, and how stores and other commercial buildings take on a new look with stucco.

In addition, sealing up joints in wood siding and around openings in old buildings, combined with the insulation value of stucco, reduces heat losses as much as 13 per cent.

In some cases the question may arise whether or not reinforcing is necessary in stucco overcoating, such as on concrete or even on old stucco. The answer to such questions is that unless there is clean, rough, rigid surface to which the new stucco coat can be properly bonded, it is always advisable to reinforce with Keymesh. There is no justification in sacrificing your reputation at the sacrifice of a few additional dollars that a reinforcing job requires.



BEFORE overcoating job was started on wood frame house.



(Above) AFTER overcoating was completed.

(Below) BEFORE overcoating was started on brick store.



(Below) AFTER overcoating was completed—a remarkable difference.



Again, the Keystone System of Stucco Overcoating produces best results for a quality stucco overcoating job. The steps in the Keystone System are similar to those followed in new stucco application, varying only in preparation stages. These are the five basic steps:

I. Properly condition the structure for stuccoing.
II. Reinforce with Keymesh for durability.
III. Apply three coats of well-mixed, properly cured stucco.
IV. Bring out stucco's full beauty.
V. Take pride in your craftsmanship.



Step I
Properly Condition the Structure for Stuccoing

The conditioning of structures for stucco overcoating varies, of course, with the type of construction. This generally breaks down into wood frame construction and masonry construction.

Conditioning Wood Frame Construction

The old wood siding or shingles should first be made secure. This means nailing down loose siding or shingles and trim. If sections are badly rotted or missing, they should be replaced to provide a fairly even surface. Where as much as 15% of old siding or shingles is decayed and loose, remove everything down to sheathing.

Where siding and shingles are not removed, extend window caps and sills and belt courses to project 1 to 1½ inches beyond what will be the new stucco surface. Allow 1 inch for stucco thickness beyond furthest projection of old siding and increase the allowance if insulating boards instead of paper are to be



BEFORE overcoating old-fashioned home furnishings store.



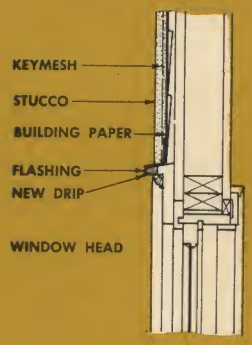
(Above) Stucco overcoating in process.

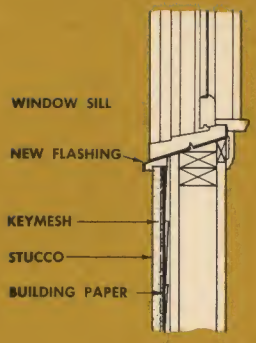
(Below) Job nearing completion.

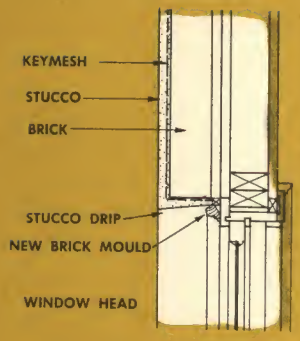


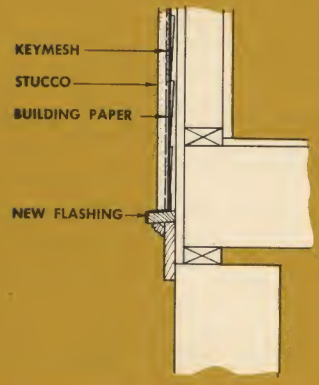
(Below) The finished overcoating job—a modern building.



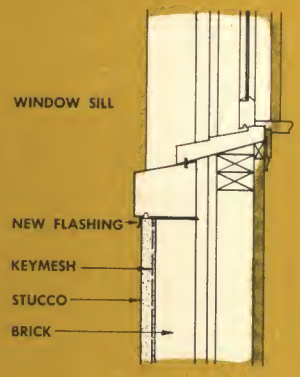








Construction and flashing details in stucco overcoating. Stucco may be applied over wood frame, brick, cement block or old stucco. Keymesh Reinforcing is essential for assured durability.



applied over old surface. Rabbett extensions to old members and coat joints with white lead.

If siding or shingles need to be removed, no extension of caps and sills is necessary unless insulating boards are to be used over old sheathing. Always allow for a 1-inch stucco thickness.

Flashings—Apply zinc or equal flashings liberally over peak caps of windows, over water table, as a drip under window sills, at intersection of stucco parapet walls and porch deck or roofs, at ends of window sills and elsewhere where water might get behind stucco. The application of flashings varies slightly depending on the base. See illustrations on this page.

Paper backing—Attach waterproofed building paper or felt weighing not less than 15 lbs. per 100 sq. ft., laid in horizontal strips over old siding, shingles or sheathing. Lap lower edges at least 3 inches; also lap over metal flashings.

Conditioning Masonry Construction

The importance of proper conditioning of the masonry back of stucco cannot be overemphasized to assure a permanent stucco exterior. Conditioning an old masonry structure begins with preparing of the surface. For best results, first remove all loose, weathered particles such as paint, oil, dust, dirt or soot. Doing so provides the best possible suction and bond for stucco.

Where practical, extend all old masonry sills or belt courses by driving masonry nails into joints or into concrete. Attach reinforcing to nails and pour concrete extensions into forms built around nails, or apply concrete with a trowel. Where impractical to extend sills and belt courses, heavy zinc or copper flashings should be attached over sills, projecting at least 1 inch beyond what will be the new stucco surface. Insert flashing in masonry joints under masonry belt courses with which

new stucco surface will eventually be approximately flush. Such flashings should project so that water will be shed about 1 inch beyond the face of the stucco.

Apply zinc or copper flashing at intersections of masonry walls, porch decks or roofs, and elsewhere where water might get behind stucco.

There is another method of furring which may be followed in some areas. It involves anchors and furring strips, which are applied in the following manner:

(a) After damp-proofing has been applied, or over dense or painted surfaces mark vertical chalk lines at 12 inch centers along entire outside wall to be stuccoed, using plumb line from top of building.

(b) At about every 4 feet vertically along these lines drive hardened or stub masonry nails (use cut nails in dry mortar joints) into nearest mortar joint, permitting nail heads to project at least 3/8 inch but not so far from masonry that they will interfere with application of lath.

(c) Along vertical chalk lines of (a) being at 12-inch centers, apply 3/8-inch furring rods or channels, or 3/4-inch channels, vertically, securely wiring to masonry nails of (b) but allow 1/8-inch space between wall and furring so as to permit tying lath to furring.

(d) Furring by driving Keymesh furring nails into mortar joints is preferred in lieu of the above, with Keymesh secured directly to the masonry.

Step II Reinforce with Keymesh for Durability



There are variations in the methods of applying Keymesh Reinforcing depending upon the type of material on which stucco overcoating is to be applied.

This manual covers applications over wood frame, masonry, concrete and old stucco. In many respects, application procedures are the same as those for new stucco jobs.

Reinforcing over Wood Frame

Apply Keymesh of 1 1/2-inch hexagon mesh, 17-gauge galvanized wire, or 1-inch 18-gauge galvanized wire. To avoid laps at corners, start Keymesh at least 6 inches from a corner. Use 1 1/4-inch Keymesh nails so that Keymesh is furred out 1/4 to 3/8 inches from the paper backing. Space nails 12 to 16 inches apart horizontally and 6 to 8 inches apart vertically. At ends and sides of mesh, lap one full mesh, and nail them together securely. Laps at ends should be staggered.

For additional details on the application of Keymesh Reinforcing, see pages 8 through 11.

Deteriorated wood siding finish to which stucco is to be applied.



Keymesh Reinforcing in place over waterproof building paper.



Stucco overcoating application is the same as new stucco work.





Keymesh Reinforcing over concrete assures durable stucco.



Detail of Keymesh application on concrete wall.

Reinforcing over Masonry

It is essential to reinforce old masonry walls softened by weather or saturated with dirt or paint. All chimneys must be reinforced. Lack of reinforcement will jeopardize the durability of the finished job.

Keymesh Reinforcing (1½-inch hexagon mesh, 17-gauge, or 1-inch mesh, 18-gauge) is applied with Keystone furring nails driven into the mortar joints, or frequently applied directly over old masonry walls with large concrete nails.

Start application of reinforcing at least 6 inches from corners, applying horizontally. At ends and sides of mesh, lap one full mesh; stagger laps at ends. Use large-head concrete nails 1-inch size or larger to secure Keymesh to the masonry surface. Space nails 12 inches apart horizontally and 8 inches apart vertically.

If masonry surface is clean and provides good suction, only enough concrete nails are needed to hold the mesh in place.



Completed application of reinforcing ready for stuccoing.

Reinforcing over Old Stucco

Where the original stucco is unsound it is advisable to remove the old materials entirely and apply waterproof paper and reinforcing to the frame, just as in new stucco application. Likewise, overcoating should not be done directly over lime, gypsum or magnesite stucco. It is preferable to remove such materials, although the application of waterproof paper and reinforcing over them is sufficient if the old surfaces are in reasonably sound condition.

It is usually good practice to reinforce over old stucco before applying new stucco coats, unless only a one-coat "refresher" job is required. Waterproof building paper or felt, and Keymesh Reinforcing are essential components of a good overcoating application. Apply paper horizontally with 3-inch laps, using cement nails for the purpose.

Then apply Keymesh Reinforcing just as over wood-sheathed construction. Use 1½-inch hexagon mesh, 17-gauge galvanized wire, or 1-inch 18-gauge galvanized wire. Apply with Keymesh furring nails to fur out the reinforcing ¼ to ⅜ of an inch from the backing. Space nails 12 to 16 inches apart horizontally and 6 to 8 inches apart vertically. At ends and sides of mesh, lap one full mesh; stagger laps at ends. Avoid laps at corners by starting at least 6 inches from corners.

Reinforcing over Cast-in-Place Concrete

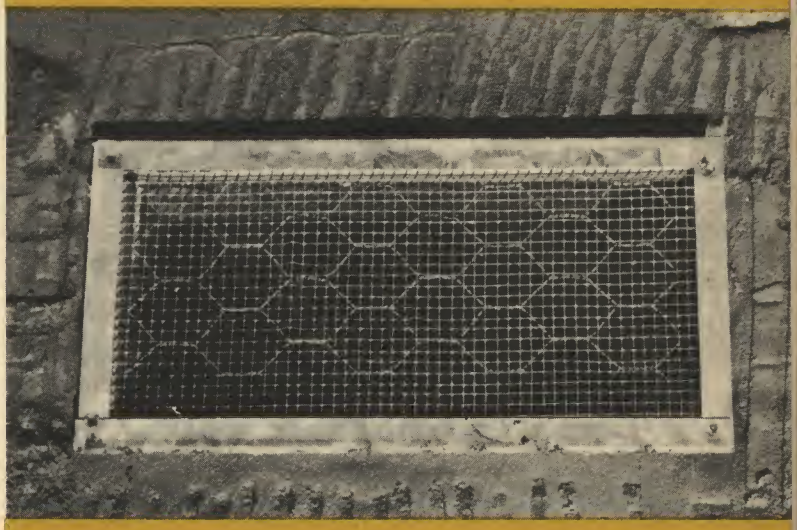
Cast-in-place concrete walls having coarse or roughened surfaces are suitable bases for direct application of stucco. However, such surfaces should be free from paint, oil, dust, dirt, soot or any material that might prevent satisfactory bond. When concrete surfaces cannot be roughened, or when they are dirty or coated with paint, Keymesh Reinforcing can be used to provide a good base for stucco. Use large-head concrete nails to apply Keymesh, spacing the nails 12 inches apart horizontally and 8 inches apart vertically.

In some cases, stucco can be applied directly over concrete. When surfaces are not rough enough, prepare them as follows:

1) Roughen with bushhammers or other special tools; wash thoroughly with water; let wall dry until suction is restored.
2) Roughen with 1 part muriatic acid to 6 parts water. Wet the wall with plain water first, then apply acid with a scrubbing brush or similar tool. After treatment, wash the wall thoroughly with water to remove all acid. Then let it dry until suction is restored.
3) New cast-in-place concrete can be roughened with a heavy wire brush or special scoring tool if forms are removed early. Take care not to remove forms before concrete is hard enough to be self-sustaining.
4) Dashing on a first coat of stucco can also be done to roughen the wall surface.
5) Roughen by special compounds painted on the form faces of new cast-in-place concrete. These retard hardening of the surface concrete. Roughness is obtained by brushing surface material after forms are



Detail of stucco application around windows.



Application of stucco around vent.

Stucco on concrete can be either one- or two-coat work. The first may be a bond coat, dashed on as described in point 4 above. The finish coat should not be less than 1/8 inch thick on both one and two-coat applications.

Steps III, IV and V in the Keystone System of Stucco Overcoating are the same as those outlined under the Keystone System of Stucco Application, on pages 12 through 25. They are:

Step III—Apply three coats of well-mixed, properly cured coats of stucco (see pages 12-16).

Step IV—Bring out stucco's full beauty (see pages 17-24).

Step V—Take pride in your craftsmanship (see page 24).

SECTION THREE
The Keystone System of Plaster Reinforcing

Reinforcing plaster is a means of counteracting stresses which develop from normal movement of lumber, building framing and from vibration. Reinforcement also safeguards weak points as an additional precaution against plaster cracking. In addition, reinforcement prevents problems in rooms where moisture may ordinarily weaken the plaster.

To be sure, a good plastering job cannot be any better than the base to which plaster is applied. If the structure behind the plaster is unsound, there is trouble ahead. If the plaster is not adequately reinforced where it should be, cracking is also likely to occur.

When to Reinforce

A good rule for reinforcing plaster is that *whenever there is any question concerning the use of reinforcing, it should be used and used extensively.*

Keymesh Reinforcing, made of 1-inch hexagonal mesh, 20-gauge, cold drawn, galvanized steel wire, is ideally suited for reinforcing plaster. It has the necessary strength, it has easy-handling qualities, and its open mesh design permits quick, easy plaster application.

Keymesh Reinforcing, used as a component in the Keystone System of Plaster Reinforcing, assures plaster strength and durability. It gives lathers and plasterers the best-recommended procedures for applying permanent, crack-resistant plaster—at most reasonable costs in material and time. This system was formulated as a result of careful checking among tradesmen and plastering authorities. It comprises all the required steps in plaster reinforcing found

WHERE

CEILINGS

Reinforce all large expanses such as combination living-dining rooms; ceiling reinforcing is desirable in all cases.



AT JUNCTURE LINES

Reinforce where wall and ceiling meet and in corners.



PLASTER NEEDS REINFORCING

AROUND DOORS AND WINDOWS

Reinforcewhere extraordinary stresses may be brought to bear.



IN ANGLES AND ARCHES

These are weak points that need protection provided by reinforcing.



IN "MOISTURE ROOMS"

In bathrooms, utility rooms, kitchens, etc., reinforcing helps to prevent plaster deterioration.



COMPLETE ROOM

Reinforce all walls and ceilings where slightly more than normal structural movement or vibration is expected.



to be most practical, quickest to apply and most satisfactory.

Actually, there is nothing radically new in the Keystone System. It emphasizes the use of reinforcing because the use of reinforcing is made easy with Keymesh. No complicated procedures are involved. Application is quick and easy, involving very little extra labor time.

The basic steps in the Keystone System of Plaster Reinforcing are:

Step I—Check for Structural Soundness
Step II—Apply Keymesh Reinforcing for Insured Durability
Step III—Use Best Suited Mixtures, Properly Proportioned
Step IV—Finish the Plastering Job with Care

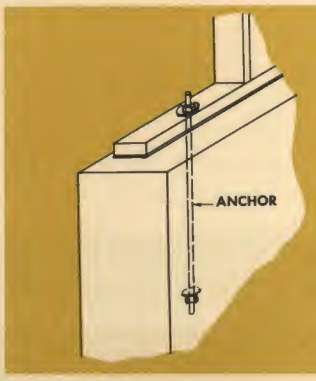
SECTION THREE
The Keystone System of Plaster Reinforcing

Step I
Check for Structural Soundness

Good plastering requires not only good workmanship by lathers and plasterers, but also by the building contractors. Inadequate support for plaster, due to the absence of rigid construction, the skimpy use of materials, or any other such reason, becomes a source of eventual trouble. If the plaster is to be firmly attached to structural elements, those elements must be properly designed and soundly constructed. These are some of the points to check:

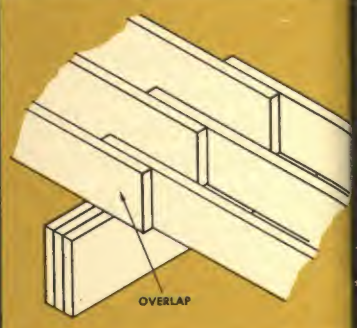
1) Structural members which carry plaster should be adequately tied in and secured to the foundation.
2) The underside of wood joisted floors should be adequately bridged diagonally.
3) Check timber trusses and other structural members for strength, for wind or snow stresses, etc., and for capacity to carry the weight of the plaster.

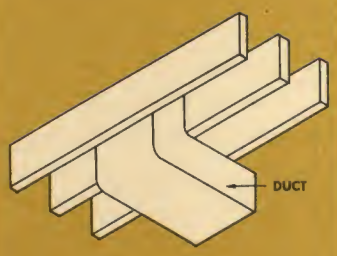
Points to Check for



Structural members which carry plaster need to be strong and rigidly secured to all of the foundation members.

Joists should be overlapped over the trusses and doubled around the openings.



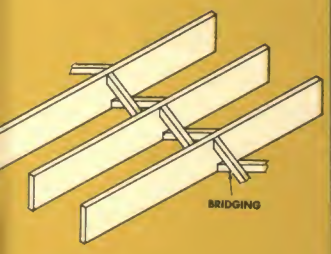


Installation of piping ducts and wiring should be done without removing girders or joists.

Doubling of studs around openings and at corners, and trussing over large openings thus eliminating stresses.



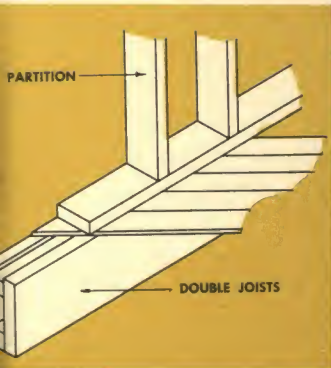
Structural Soundness



Bridging the underside of wood joisted floors prevents abnormal movement.

Adequate footings are essential as a means of preventing abnormal structural movement.





Doubling of joists under partitions which run in the same direction as the joists is recommended.

Diagonal bracing at corners adds sturdiness to the structure and firmness to finished plaster.



4) Avoid narrow footings on filled-in land, as a means of preventing unusual structural movement; footings should be anchored to one another.
5) Avoid the use of green lumber, subject to shrinkage and warping.
6) Do not remove main supporting girders or joists in order to install piping ducts or wiring.
7) The use of 2 by 10 or at least 2 by 8 joists is recommended; joists under partitions should be doubled.
8) Studs around windows and doors should be doubled and trusses installed over openings exceeding four feet.
9) Diagonal bracing of wood studs at corners is desirable in houses.
10) As a general rule, use standard construction procedures, without attempting short-cuts which may save a few cents at the sacrifice of a good plastering job.

Of course, some structural movement of building members is expected, nor should normal movement cause plaster cracking. It is the larger movements that produce trouble, and provision should always be made to avoid such excessive movements when possible, or to counteract them by reinforcing plaster—as explained in Step II of the Keystone System of Plaster Reinforcing.

Structural soundness is an important step in the application of long-lasting plaster.



Step II
Apply KEYMESH Reinforcing for Insured Durability



The "when" and "why" of reinforcing plaster has been covered in previous paragraphs in this book. Inasmuch as both ceilings and walls, as well as juncture points, angles and arches require reinforcing, the procedure for all such work is given here.

One important point requires emphasis: When reinforcing is to be applied, do not skimp. Reinforcing should be adequate to provide the additional strength needed.

Because of the construction features of Keymesh Reinforcing, it is particularly well suited for application over such bases as gypsum lath and fiber insulation lath. The use of Keymesh reinforcing over such standard bases results in the construction of walls and ceilings that are durable and crack-resistant. Normal stresses and strains are distributed over large areas, and rooms become a complete, reinforced *unit.* Keymesh may also be used over old plaster, masonry or wood lath in much the same way it is used on gypsum lath.

Application of Lath

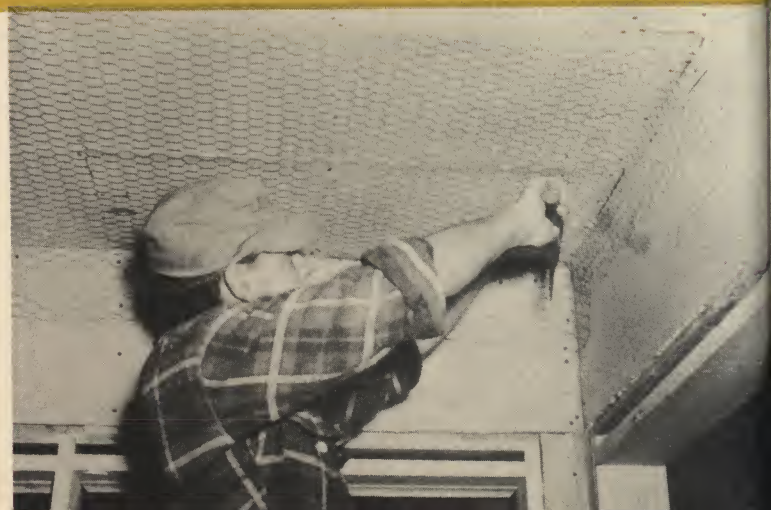
Gypsum Lath—Supports for gypsum lath should be not more than 16 inches apart. Gypsum lath is secured at each support with 1½-inch, 13-gauge nails with ⅜-inch heads, spaced not over 4 inches apart and with underside of nails driven flush with the face of the lath. Joints between walls and ceilings should be staggered. Lath is then applied with the long dimensions at right angles to the framing members, with joints broken in each course. Leave a space not exceeding ¼ inch between lath, but do not butt the lath together. Gypsum plasterboards should not be wetted prior to application.

Fiber Insulation Lath—Space supports not more than 16 inches apart. Nails should be placed not less than ⅜ inch from the ends and not less than ½ inch from shiplapped, tongued and grooved, or interlocking edges. End joints (except interlocking type) shall be approximately 3/16 to ¼ inch. Shiplapped, tongued or grooved, or interlocking edges should be fitted to moderate contact.

Keymesh reinforcing applied to ceilings is first secured by nailing it in the center and then stretching each way when nailing edges.



When applied to walls, reinforcing is first nailed at the top and then unrolled downward. Nailing the mesh to studs follows.



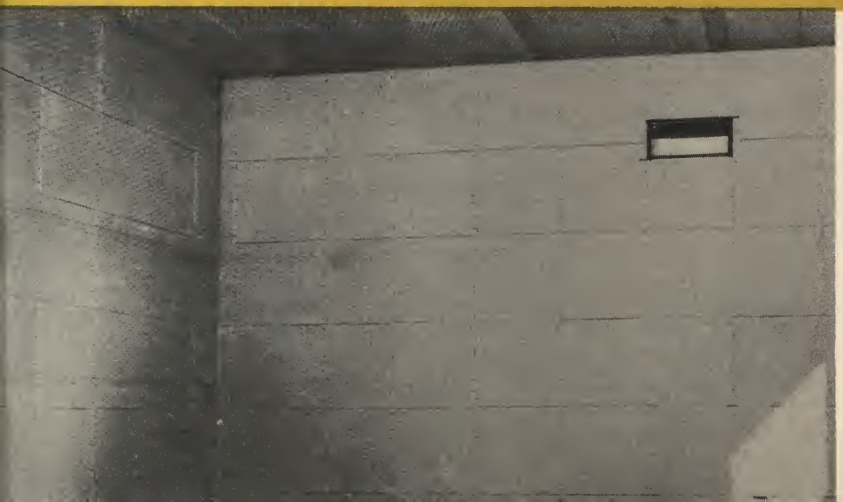
Application of Reinforcing

The combination of gypsum lath and Keymesh Reinforcing has been used with outstanding success by many plastering contractors as a means of increasing plaster durability and crack-resistance. One-inch by 20-gauge Keymesh acts as an ideal combination key and reinforcement for new plastering jobs or for overcoating over painted or papered interior walls. Keymesh goes on swiftly over lath because it is so easy to handle. The complete lathing, reinforcing and plastering job is completed quickly and easily.

These are the procedures in the application of Keymesh Reinforcing:

1) Cut a roll of 1-inch by 20-gauge Keymesh (36-inch width) into three approximately even lengths and loosely reroll each section.
2) Apply outside of mesh as it comes off the roll against wall or ceiling.
3) Where ceilings only are being reinforced, run Keymesh 4 inches below the ceiling-wall juncture all around the room. At the start on ceilings, to hold width of mesh in place, nail in the center and stretch each way when nailing edges.
4) Where both walls and ceilings are being reinforced, apply one width of Keymesh completely around the room at top of side walls, with upper edge flush with ceiling. Nail the upper edge first, and continue down each stud, stretching the mesh downward. Then work on the ceiling, forming a 4-inch drop or apron down on the side walls over the strip of mesh first applied. After finishing the ceilings, then apply additional widths around the room until walls are completely covered.
5) Lap Keymesh two full meshes. This can be done easily without bulking up the joints.
6) Run right over electrical outlets and vents, cutting openings afterwards with tin snips.
7) Nail mesh flat—do not fur. Nail each sheet securely to every support it crosses.
8) One-inch by 20-gauge Keymesh serves as joint, angle and corner reinforcement. Strips nailed into position in these vulnerable spots will help immeasurably to prevent plaster cracking. See accompanying diagrams for correct positioning of these reinforcing strips.
9) Use hatchet blade to form sharp, neat corners.

The application of reinforcing around openings is always recommended as a means of counteracting plaster stresses at such points.



This completely reinforced room—ready for plaster application—is an example of good construction practice.



Step III
Use Best-Suited Mixtures, Properly Proportioned



Inasmuch as qualified plasterers are completely acquainted with plaster-mixing procedures, this manual covers the subject only in general terms. Long-time practice, and recommendations by plastering associations and manufacturers, have undoubtedly shown what is good procedure and what is not. Plasterers know that the good procedures are always preferred.

Generally, there are three requirements for good plaster mixtures. Regardless of the material used, if the mixtures conform to these requirements, the finished mix will be a good one. These requirements are:

1) When in a plastic state, the mixture should be such that it can be spread into position without requiring an impractical amount of care and effort.
2) The mixture should harden quickly enough to prevent undue delay in the building operation, and shrinkage which normally accompanies the hardening should be slight.
3) The properties of the hardened material should meet your own highest standards.

The duration of the hardening process and the ultimate hardness of the plaster depend upon the kind and quantity of cementitious material used. The properties of the cementitious material and aggregate, and their relative proportions, determine the ease with which the plaster can be applied.

In a large majority of cases, the cementitious material is either lime or gypsum. A mixture of the two might be used. Sometimes lime might be tempered with a little Portland or Keene's cement, or Portland cement tempered with a little lime.

The amount of water used in the mix must generally be determined by the consistency obtained. In all cases, use clean water, "good enough to drink." Actually, the amount of water that is added to a cementitious material to develop the required workability is far in excess of the amount required chemically for the hydration of the material. Too much water, of course, will result in excess shrinkage when the plaster begins to harden and the water evaporates. Use as little water as possible, to produce a plaster of workable consistency. The addition of sand to the mixture, without changing the water volume, reduces the relative volume of water and accordingly reduces the possibility of shrinkage. Therefore, an inert aggregate must be regarded as a necessary ingredient of plaster, excepting only those which harden before the excess water has had time to evaporate.

Hair or fiber may also be considered as an aggregate, except that they act as a kind of reinforcement for the plaster while in a plastic state. Neither is used extensively in modern plastering. Fiber can be of animal or vegetable origin. It should be long enough to serve its purpose (½ inch), but not over 2 inches.

Mixing Plaster

Machine mixture is generally recommended, and should be used whenever the size of the job justifies it. The results are better control of the mixture, more thorough mixing, and more uniform plaster of better quality.

When ingredients do not require preliminary soaking, mix the dry materials thoroughly to uniform color. Add ingredients to the water when hand mixing is done. With a mixing machine, this order is not required.



The first coat of plaster trowels on quickly and easily over Keymesh Reinforcing, providing an even base for a smooth finished job.



Keymesh Reinforcing permits easy flow of plaster through and around the strong steel open-mesh wires. Reinforcing is firmly embedded.



The Keystone System of Plaster Reinforcing is the answer to unnecessary, troublesome and costly plaster cracking—an extra feature that helps sell homes.



The end result of the Keystone System is a room unit of plastered walls and ceilings strongly held together by Keymesh Reinforcing.



Step IV
Finish the Plastering Job with Care

Just as sound structural support and reinforcing is necessary for a good plastering job, so is good workmanship in applying the plaster. Good workmanship requirements are generally known by the plastering trade, and this manual does not presume to tell experienced plasterers how their work should be done. However, for the purpose of checking the "finer points" of a smoothly finished, top-quality job, information is given here as a check-list for contractors and tradesmen.

As a general rule, all plastering shall be carried down to floors back of all wood base, down to cement bases or curbs. It should be applied well up to and around openings, into door and window openings up to frames, and elsewhere not shown to be finished with wood or other material.

Whether the plastering job is to be two-coat or three-coat is determined largely by the type of material used.

While the primary function of plaster on lath is undoubtedly decorative, its other functions are too important to be neglected. A lath and plaster structure—partition, ceiling or inner wall surface—must be rigid. It must be acoustically absorbent. It must have a certain amount of fire resistance, to protect the structures behind it and to prevent the spread of fire. It must have some heat and moisture-insulating value.

All these requirements are met when plaster is applied to a rigid, reinforced backing and is applied to proper thickness. A thickness of ½ inch, applied to ⅞-inch grounds, has been generally adopted for plaster on lath. Where plaster is applied directly to masonry, it must be able to withstand ordinary abuse, but may not need to be ½-inch thick. Plaster on masonry need be no thicker than is required to produce a true and plane surface.

SECTION FOUR
Other Applications of KEYMESH Reinforcing

Keymesh Reinforcing serves to strengthen not only stucco and plaster, but also several other surfacing materials. This includes tile, terrazzo, asphalt tile flooring, tile roof deck and insulating materials. Basic procedures in the application of these materials are given below.

Reinforcing Interior Tile

Reinforcing of tile is essential because it adds durability to the application in locations where plaster or tile normally is subject to deterioration from moisture.

Inasmuch as interior tile application is done over a scratch plaster coat, the procedures for application of Keymesh Reinforcing is the same as in reinforcing plaster. The difference in complete application is in the securing of tile blocks to the scratch coat, instead of adding additional plaster coats.

Reinforcing Terrazzo

There are two methods of installing terrazzo over concrete—one is to bond it to the structural slab; the other, to separate it as a floating slab. The floated type of terrazzo floor construction is affected less by structural movements. The National Terrazzo and Mosaic Association recommends it as insurance against cracks in pattern work, and in lobbies, corridors and areas where appearance is important. It requires a total thickness of 2½ inches. In its application, a sand cushion is placed over the concrete structural slab. Fifteen pound paper felt is then placed over the sand. A mixture of 1 part cement and 4 parts sand is then poured. When it is ⅝-inch thick, 1½-inch by 17-gauge Keymesh Reinforcing is laid over the section, lapped 2 inches at intersections. Then another 1-inch layer is poured, completing the underbed. A ⅝-inch terrazzo topping is then applied and ground down.

In applying terrazzo over new or old wood construction, the National Terrazzo and Mosaic Association recommends a floor with a minimum thickness of 2½ inches. This consists, first of heavy tar paper, lapped 4 inches, covering the wood. Then a 1⅞-inch mortar under-

Applying Keymesh Reinforcing as a base for interior tile. Notice the ease of handling.



An attractive, permanent tile installation reinforced with Keymesh.

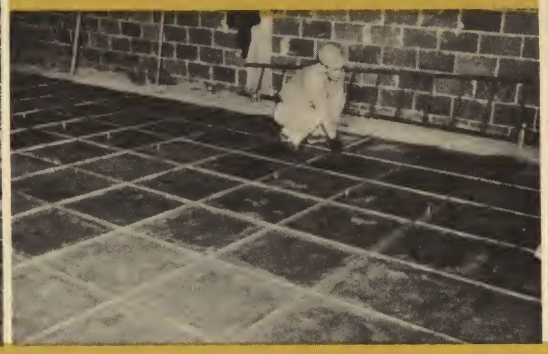




Keymesh Reinforcing applied to the terrazzo underbed.



Terrazzo topping is applied to the reinforced underbed.



Stripping is placed in position to hold the terrazzo firmly.



The completed terrazzo application —an attractive and durable floor.

bed, reinforced with a light reinforcing mesh (Keymesh is very suitable—and is liked by craftsmen for its easy handling, by contractors for its economy) topped by a 5/8-inch layer of terrazzo.

The underbed for terrazzo, consisting of one part Portland cement and four parts coarse screened sand, is spread and brought to a level not less than 5/8-inch below the finished floor. While the underbed is still in a semi-plastic state, install 1 1/4-inch dividing strips. These strips are commonly half-hard brass, zinc alloy or nickel-silver.

Apply the terrazzo topping not less than 5/8 inch thick. This mix consists of 200 pounds of marble granule to 100 pounds of gray or white Portland cement, mixed dry. Only enough water should be added to make the mix *plastic,* not flowing. If colored pigments are added, they should be lime-proof and non-fading.

Then place the mix in the spaces formed by the dividing strips and roll it into a compact mass by means of heavy stone or metal rollers until all extra cement and water is extracted. Hand trowel to an even surface, disclosing the lines of the strips on a level with the terrazzo filling. The finished surface should show a minimum of 70% marble granule.

Keep the floor moist for the next six days at least—by sand, paper or curing mats.

When the terrazzo surfaces have set sufficiently hard (as determined by observation), they should be machine rubbed. Then resurface them using a No. 80 grit or finer abrasive stone, after which a light grouting of neat Portland cement is applied, filling all voids. Finally, the grouting coat is removed no sooner than 72 hours after application, using a stone not coarser than No. 80 grit.

Ramped or other surfaces in terrazzo floors can be made non-slip by the addition of an abrasive aggregate. For heavy duty floors, the proportion should be two parts of abrasive to three parts of marble and the abrasive aggregate mixed in the terrazzo topping for its entire thickness. For lighter traffic floors, the abrasive is sprinkled on the surface only, so that the approximated 70% aggregate surface in the finished floor is three parts marble granule and one part abrasive aggregate.



Keymesh Reinforcing being nailed to old floor.



Floor surfacing being applied over reinforced base.

A common procedure in the application of asphalt flooring is to cover the wooden structural base with heavy building felt, over which Keymesh Reinforcing is nailed into position. Then a mixture of magnesite concrete is poured over the surface, followed by surfacing with asphalt flooring.

Application of tile roof decks may vary from job to job, but it is always advisable to reinforce the deck area with Keymesh.

A typical installation of asphalt tile roof deck proceeds as follows:

First, a 4-inch cement roof was poured, using regular galvanized tie rods for reinforcing. Then, over this for insulation a 4 to 1 mixture of Zonolite aggregate and Portland cement was poured. To provide drainage it was applied from 2 inches thick on the outer edges down to a very fine depth at the drains. Over this, five plies of fifteen pound tarred felt paper were applied and mopped on to insure a leakproof roof. Next, a galvanized steel wire reinforcing was laid, 1-inch hexagonal mesh by 18-gauge Keymesh, in widths of 36 inches. All joints were lapped 2 inches. This reinforcing was

Roof deck installation starts with application of Keymesh Reinforcing in cement underbed.



The reinforced concrete is then smoothed out in preparation for application of tile.

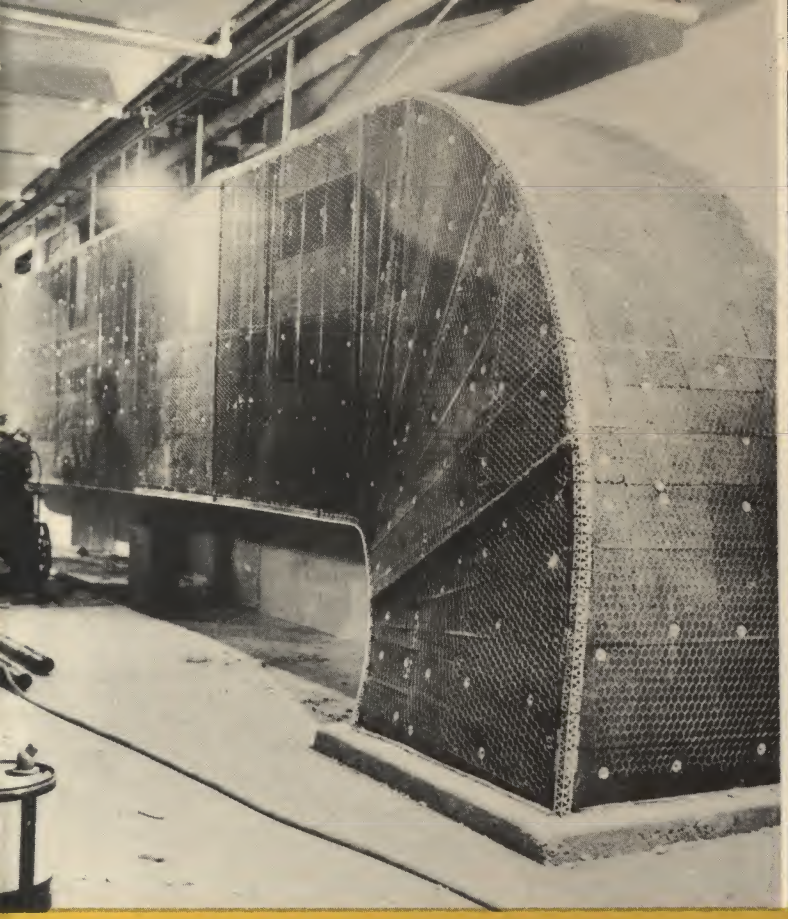


Tile being placed over Keymesh-reinforced concrete, while concrete is still wet.



The completed installation—with Keymesh as a secure base for a smooth tile roof.





Keymesh used to provide a tight, durable key for insulation covering on supply ducts.



Keymesh Reinforcing is an easily handled, economical material for insulation base.

then covered and completely imbedded with a mixture of Portland cement and sand (3 to 1). While this was still wet, 6-inch by 6-inch, 3/4-inch thick Quarry tile was laid with joints of 3/8 inch between the tile. After setting, a mixture of 1/2 Portland cement and 1/2 sand was troweled into the tile joints, making a fine, smooth roof.

Insulation Reinforcing

Keymesh Reinforcing is commonly used to provide a tight, durable key for insulation coverings on heating and air conditioning pipes and ducts.

The surfaces to be insulated are first covered with a cork and double wool felt base. On large main ducts the cork base is generally 1 inch thick; on dehumidifiers in air conditioning systems it is 2 inches thick. Ribs of the ducts are also covered with wool felt.

One-inch by 20-gauge Keymesh Reinforcing is then stapled to the cork base, to provide a sure bond for asbestos or other insulating material to be applied. Keymesh is ideally suited for this type of reinforcing because it is easily handled and can readily be formed around corners and angles if necessary.

The Keymesh is applied in continuous strips wherever possible, such as along the top of rectangular ducts. Along the sides of large ducts it is applied vertically and trimmed off at curved areas. It is applied around pipes. In all cases the reinforcing is lapped by two meshes.

Stapling of Keymesh Reinforcing to the cork base is done at intervals frequent enough to provide a smooth application. At corners, curves and angles the intervals are more frequent to hold the reinforcing smoothly in position.

STUCCO APPLICATION DATA

Amounts of Cement and Sand Required

NOTE—The areas covered by one barrel of cement or one cubic yard of sand, as given below, are calculated for an average sand and without allowance for waste. In estimating, allowance must be made for waste. Openings are not deducted. When figuring for stucco, the loss of mortar, forming the keys for the first coat, should be taken into account.

Area Covered by 1 Barrel of Cement in Various Mixes

Mixture Parts by Volume		Thickness of Mortar Coat				
		¼ Inch	⅜ Inch	½ Inch	¾ Inch	1 Inch
Cement	Sand	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.
1	1½	336	226	168	112	84
1	2	404	270	202	135	101
1	2½	472	314	236	157	118
1	3	542	362	271	181	136

Area Covered by 1 Cubic Yard of Sand in Various Mixes

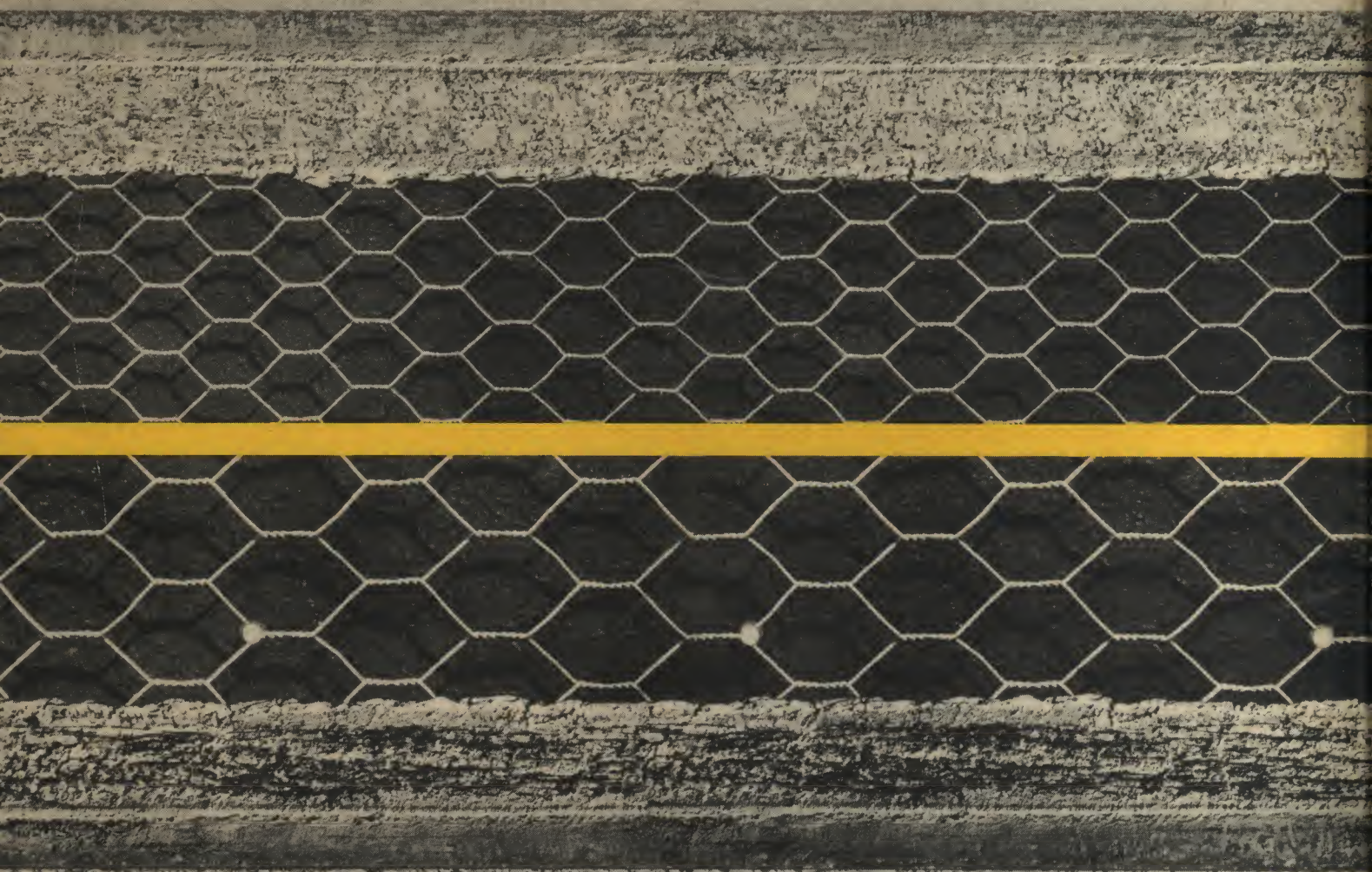
Mixture Parts by Volume		Thickness of Mortar Coat				
		¼ Inch	⅜ Inch	½ Inch	¾ Inch	1 Inch
Cement	Sand	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.
1	1½	1508	1006	754	503	377
1	2	1364	910	682	455	341
1	2½	1282	855	641	427	321
1	3	1222	815	611	407	306

Quantities of Stucco Material Required Per 100 Sq. Ft. of Wall

		1:2½ Mix		1:3 Mix		1:3½ Mix	
Thickness	Cu. Ft. Mortar	Cement sacks	Sand cu. ft.	Cement sacks	Sand cu. ft.	Cement sacks	Sand cu. ft.
¼″	2.08	.79	1.96	.68	2.06	.60	2.10
⅜″	3.13	1.19	2.95	1.03	3.10	.90	3.16
½″	4.17	1.58	3.94	1.37	4.12	1.20	4.22
⅝″	5.21	1.98	4.92	1.71	5.15	1.50	5.27
¾″	6.25	2.37	5.90	2.06	6.18	1.80	6.32
1″	8.33	3.16	7.86	2.74	8.24	2.40	8.42

Proportions of Mixture	Sacks Cement	Cu. Ft. Sand	Wpfg. Powder Lbs.	Wpfg. Paste Lbs.	½ in. Sq. Ft. Covered	¾ in. Sq. Ft. Covered	1 in. Sq. Ft. Covered	1¼ in. Sq. Ft. Covered	1½ in. Sq. Ft. Covered
1:1	1	1	2	0.6	33.0	22.0	16.5	13.2	11.0
1:1½	1	1½	2	0.6	42.0	28.0	21.0	16.0	14.0
1:2	1	2	2	0.6	50.4	33.6	25.2	20.1	16.8
1:2½	1	2½	2	0.6	59.4	39.6	29.7	23.7	19.8
1:3	1	3	2	0.6	67.8	45.2	33.9	27.1	21.6

NOTE—These figures are based on average conditions and may vary 10% either way, according to the quality of the sand used. No allowance is made for waste.



KEYSTONE STEEL & WIRE COMPANY

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